REMARKS

Review and reconsideration on the merits are requested.

The only rejections posed are art rejections.

Claims 1-4 are rejected under 35 U.S.C. § 102(b) as anticipated by JP 11-216537 Daikuhara et al (Daikuhara). Paragraph 2 of the Action.

Claims 5-22 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Daikuhara in view of US 6,527,879 Kubota et al (Kubota). Paragraph 5 of the Action.

The Examiner's position is set forth in the Action and will not be repeated here except as necessary to an understanding of Applicants' traversal which is now presented.

Traversal

Rejection of Claims 1-4

The Examiner states in Paragraph 2 of the Office Action: "Daikuhara et al teach a cast steel piston for an internal combustion engine."

However, Daikuhara actually discloses an evanescent model 1a to be used for casting a piston 1 of an internal combustion engine by a lost form method where a combustion chamber 2 at the center of a top part of the piston and a cooling cavity 7 located outside of a diameter direction of the combustion chamber 2 are copied, respectively. The model 1a comprises plural divided pieces 21, 22 and 23 which are adhered together, and the divided face 24 thereof is set inside the cooling cavity 7 in the diameter direction at a height where the diameter of the combustion chamber 2 becomes the maximum (see Abstract and Fig. 1(a) and (b) of Daikuhara attached to the Action).

Although the Abstract of Daikuhara states: "To make manufacturing of a casting steel piston possible by a lost form processing method," in the column of "PROBLEM TO BE

SOLVED," the term "a casting steel piston" 'has been incorrectly translated. This term should be correctly translated to as –a casting iron piston–. Daikuhara clearly describes an evanescent model to be used for casting a piston of an internal combustion engine made of cast iron by a lost form method (see the English translation of paragraphs [0004] and [0005], lines 1-3, of Daikuhara attached hereto).

In contrast to Daikuhara, amended claim 1 calls for: "An integrally cast steel piston for internal engines formed by pouring a cast steel into a sand mold having a cavity having a shape of said integrally cast steel piston, wherein said cast steel has a microstructure containing eutectic carbides forming eutectic colonies, which are assemblies of eutectic carbides and a matrix phase". Following claim 1 makes it possible to provide a piston having an improved seizure resistance without greatly losing ductility as well as good wear resistance and improved oil retainability (see page 6, lines 7-13, and page 9, lines 6-21 of the specification). Such features are completely different from the evanescent model of Daikuhara used for casting a piston of an internal combustion engine by a lost form method.

For the reasons advanced, Applicants have pointed out differences between claim 1 and Daikuhara and respectfully submit claim 1 is not anticipated by Daikuhara.

Since claims 2-4 depend from claim 1, they are also not anticipated by Daikuhara.

Withdrawal is requested.

Rejection of Claims 5-22

Amended claim 5 calls for: "An integrally cast steel piston for internal engines formed by pouring a cast steel into a sand mold having a cavity having a shape of said integrally cast steel piston, wherein said cast steel has a microstructure containing eutectic carbides forming eutectic colonies, which are assemblies of eutectic carbides and a matrix phase, said cast steel having a

composition comprising, by mass, 0.8% or less of C, 3% or less of Si, 3% or less of Mn, 0.2% or less of S, 3% or less of Ni, 6% or less of Cr, 6% or less of Cu, and 0.01-3% of Nb, the balance being substantially Fe and inevitable impurities". Following claim 5, it is possible to provide a piston excellent in seizure resistance and thermal cracking resistance (see page 36, lines 8-12 of the specification).

Because the features of Daikuhara are different from those of amended claim 5 above, the amended claim 5 is not obvious over Daikuhara for the same reasons as amended claim 1.

Kubota discloses an elongate piston ring material with self-lubrication suitable for producing a piston ring for an internal combustion engine, the piston ring material comprising a steel consisting essentially, by mass, of not less than 0.3% but less than 0.8% carbon, 0.1 to 3.0% silicon, 0.1 to 3.0% manganese, 0.03 to 0.3% sulfur, 0.3 to 6.0% chromium, 0 to 3.0% copper, balance iron. The piston ring material includes sulfide inclusions each having an aspect ratio (ratio of maximum size to minimum size) not less than 3 when observed in the longitudinal structure of the material, the sulfide inclusions in the longitudinal structure being oriented so that an intersecting angle made between an imaginary, straight line passing the maximum size of any one of the sulfide inclusions and another imaginary, straight line passing the maximum size of another of the sulfide inclusions is not more than 30 degrees (see Abstract, lines 1-15, of Kubota).

The Examiner states in Paragraph 5, lines 6-7, of the Office Action: "Kubota et al teach a piston ring having the same composition as claimed."

However, Kubota discloses at column 1, lines 17-29 that:

"A piston ring for use in an internal combustion engine, particularly in a car engine has heretofore been formed of cast iron, but has been shifted to a so-called steel piston ring made by

forming a steel wire into a ring shape. Specifically, the piston ring is generally manufactured by a process having the steps of performing hot working, such as forging and hot-rolling, of an ingot with a predetermined composition to obtain a wire stock, further performing drawing and the like to obtain a steel wire material corresponding to a small sectional shape of the piston ring, and performing hardness tempering and bending to form the ring shape with a determined curvature,"

Kubota also states at column 2, lines 29-36 that:

"In conventional technique, S is organized and added to engine oil as an extreme-pressure additive to prevent seizure. On the other hand, the inventors have found that when sulfides such as MnS arc made to exist in the steel, S forms in-situ a sulfide film on a newly generated surface occurring on a friction surface by frictional heating, and this effectively enhances the lubricating performance,"

Kubota further teaches at column 7, lines 1-11 that:

"S is a representative element to deteriorate the steel mechanical properties. If no countermeasure concerning the deterioration of the strength is taken in a case of S-containing steel, it-is-difficult to establish the steel piston ring. For-example, JP-A-7-258792 in which S addition, for example, as much as 1% is possible includes even a cylinder liner in which a sufficient forging ratio cannot be obtained and relates, in principle, to a cast steel. Actually, what is made it possible to form the steel piston ring with a relatively low cost is plastic working techniques such as drawing, rolling, and bending."

Considering this disclosure in Kubota, although Kubota teaches a piston ring formed from a steel, Kubota does not teach or suggest any integrally cast steel piston for internal engines formed by pouring a cast steel into a sand mold having a cavity with a shape of the integrally cast steel piston, where the cast steel has a microstructure containing eutectic carbides forming

eutectic colonies, which are assemblies of eutectic carbides and a matrix phase as claimed in amended claim 5.

Kubota merely discloses technology regarding formation with plastic working techniques such as drawing, rolling, and bending.

Further, contrary to a piston ring having a simple shape, such as a narrow plate machined to a ring shape, as disclosed in Kubota, to integrally cast a piston possessing a. complicated shape having thin parts and machined parts, one needs high castability and machinability as production characteristics in addition to heat resistance such as high-temperature yield strength, high-temperature rigidity and thermal cracking resistance, seizure resistance, etc., required characteristics at the time of the use (see page 4, lines 13-23 of the specification).

Applicants respectfully submit that for the reasons above advanced, amended claim 5 is not obvious over Daikuhara in view of Kubota.

In short, Daikuhara does not teach or suggest the features of amended claim 5 and Kubota fails to teach or suggest the use of a cast steel to provide a piston excellent in seizure resistance and thermal cracking resistance; accordingly, withdrawal of the rejection of claims 5-22 as obvious over Daikuhara combined with Kubota is requested.

Applicants rely upon the arguments above to support the unobviousness of remaining claims which are rejected, but have some specific comments on amended claim 13.

Amended claim 13 calls for: "An integrally cast steel piston for internal engines formed by pouring a cast steel into a sand mold having a cavity having a shape of said integrally cast steel piston, said cast steel having a microstructure having eutectic carbides at an area ratio of 1-35%, said eutectic carbides forming eutectic colonies, which are assemblies of eutectic carbides and said matrix phase."

The distinguished feature of the invention of amended claim 13 is that in the integrally cast steel piston for internal engines formed by pouring a cast steel into a sand mold having a cavity having a shape of said integrally cast steel piston, the cast steel has a microstructure having eutectic carbides at an area ratio of 1-35%, the eutectic carbides forming eutectic colonies, which are assemblies of eutectic carbides and said matrix phase, thereby making it possible to obtain a piston having good high-temperature yield strength, high-temperature rigidity, thermal cracking resistance and room-temperature elongation, as well as good seizure resistance and ductility (see page 8, line 15 to page 9, line 4 of the specification), Daikuhara and Kubota are both silent on these benefits of the invention..

Withdrawal of all rejections and allowance is requested.

Basis for Amendments

As described in Example 46 of the specification, an integrally cast steel piston for internal engines per the present invention is formed by pouring a cast steel into a sand mold having a cavity having a shape of a piston as shown in Fig. 1. The cast steel used in the present invention has a microstructure containing eutectic carbides forming eutectic colonies, which are assemblies of eutectic carbides and a matrix phase, as described at page 9, lines 6-9 of the specification, which is a very important features of the present invention.

Attachments

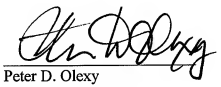
A three month Petition for Extension of Time.

A translation of relevant portions of Daikuhara.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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